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ABSTRACT

The Cooperative Integrated Reading and Composition Program (CIRC), which combines individualized instruction with cooperative learning, was evaluated in two studies. In the first study, 461 third and fourth graders were pulled out of their reading classes for part or all of the reading period over a 12-week period and CIRC was implemented. In the second study, conducted over 24 weeks, 450 third and fourth graders were pulled out of their scheduled resource and remedial classes and CIRC was implemented at times other than normal language arts periods. Results of both investigations supported the effectiveness of CIRC on: (1) students' reading and writing achievement; (2) vocabulary; (3) the major components of reading proficiency--decoding, comprehension, and vocabulary; (4) language expression measures, both on standardized tests and writing samples; and (5) informal reading inventories for partner reading and partner word practice activities. However, results differed with respect to mainstreamed learning disabled students. The effects on reading and spelling scores were not statistically significant in the first study, but the second study indicated substantial effects on reading vocabulary and comprehension. Moreover, the second study revealed substantial positive results of CIRC on reading comprehension, language mechanics, language expression, and oral reading, whereas the first study found no effects. (JD)

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Report No. 5

November, 1986

READING INSTRUCTION IN THE MAINSTREAM: A COOPERATIVE LEARNING APPROACH

Nancy A. Madden, Robert J. Stevens, and Robert E. Slavin

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The mission of the Center for Research on Elementary and Middle Schools is to produce useful knowledge about how elementary and middle schools can foster growth in students' learning and development, to develop and evaluate practical methods for improving the effectiveness of elementary and middle schools based on existing and new research findings, and to develop and evaluate specific strategies to help schools implement effective research-based school and classroom practices.

The Center conducts its research in three program areas: (1) Elementary Schools, (2) Middle Schools, and (3) School Improvement.

The Elementary School Program

This program works from a strong existing research base to develop, evaluate, and disseminate effective elementary school and classroom practices; synthesizes current knowledge; and analyzes survey and descriptive data to expand the knowledge base in effective elementary education.

The Middle School Program

This program's research links current knowledge about early adolescence as a stage of human development to school organization and classroom policies and practices for effective middle schools. The major task is to establish a research base to identify specific problem areas and promising practices in middle schools that will contribute to effective policy decisions and the development of effective school and classroom practices.

School Improvement Program

This program focuses on improving the organizational performance of schools in adopting and adapting innovations and developing school capacity for change.

This report, prepared by the Elementary School Program, presents the results of two experimental evaluations of CIRC -- a reading and writing program of instruction that combines individualized instruction with cooperative learning.

Abstract

This report presents two experimental evaluations of the Cooperative Integrated Reading and Composition Program (CIRC). The CIRC program combines individualized instruction and cooperative learning in order to meet the instructional needs of all students in the classroom, including mainstreamed students. Study 1 was conducted for 12 weeks with 461 third- and fourth-grade students in 21 classes in a suburban Maryland school district; Study 2 was conducted for 24 weeks with 450 third- and fourth-grade students in 22 classes. Both studies found significant benefits for achievement for CIRC students compared to control group students. Study 2 found significant benefits also for mainstreamed students.

Introduction

The Public Law 94-142 provision that students be educated in the "least restrictive environment" has caused profound change in regular as well as special education. Increasing numbers of students with mild academic handicaps now attend regular classrooms for part or all of their school days.

Research on mainstreaming of these students generally finds that regular class placement benefits their achievement and social development (Madden & Slavin, 1983a), but many problems remain. Regular teachers must accommodate their instruction to meet the needs of academically handicapped students while still meeting the needs of the rest of their class, a conflict that makes instruction more difficult and that often leads to regative attitudes of these teachers toward mainstreaming (Harasymiw & Horne, 1976).

Effective integration of students with mild academic handicaps in regular academic classes presents a serious problem of instructional design. If students are mainstreamed in academic subjects only if they are performing near the level of their non-handicapped classmates, then few academically handicapped students will be mainstreamed. If a broader range of academically handicapped students are to be mainstreamed in academic subjects, particularly in such subjects as reading and mathematics, then regular classroom teachers need to have effective methods of organizing their classes to meet individual needs.

One way regular classroom teachers might organize their classes to accommodate a wide range of student performance levels is through individualized instruction. If all students work at their own levels and rates, mainstreamed students who are performing well below the level of other students will still be full participants in all classroom activities, avoiding the stigma and coordination problems of pullout programs.

Until recently, research on individualized instruction programs has not generally supported their effectiveness in such subjects as reading and mathematics (Schoen, in press; Miller, 1976; Horak, 1981). One recent individualized method, the Adaptive Learning Environments Model (ALEM; Wang, 1981), was specifically designed to incorporate academically handicapped students in regular classes. The only study of ALEM to use a control group (Wang, 1982; Wang & Birch, 1984) found positive but non-significant effects on the reading achievement of academically handicapped students, and no effects for non-handicapped students. In mathematics, no effects were found for either group.

In contrast to the disappointing results of previous research on individualized instruction, a recent project at Johns Hopkins University developed and evaluated an individualized model which proved to be highly effective for academically handicapped as well as non-handicapped students. This program, Team Assisted Individualization (TAI; Slavin, Leavey, & Madden, 1986) combines individualized instruction with cooperative learning to teach mathematics in

the upper elementary grades. Five of six studies found that TAI increased the achievement of all students significantly more than did control methods (Slavin, Leavey, & Madden, 1984; Slavin, Madden, & Leavey, 1984a; Slavin & Karweit, 1985). TAI students gained an average of twice as many grade equivalents as control students on standardized tests of mathematics computations (Slavin, 1985). Similar positive effects were seen for mainstreamed academically handicapped students, and these students were also better accepted by classmates and better behaved than were students mainstreamed in control classes (Slavin, 1984a; Slavin, Madden, & Leavey, 1984b).

There are several reasons that the TAI program succeeded where earlier individualized models failed. First, students in TAI work in 4-5 member heterogeneous learning teams, in which they both help one another with individualized units and check one anothers' work. The teams earn certificates based on the total number of units completed and the accuracy of independently administered final tests taken by all team members, so students are motivated to do a good job of explaining and checking. Research on cooperative learning has consistently found that when students have an opportunity to work together and are rewarded on the basis of the learning of all team members, they learn significantly more than they do in traditional instruction (Slavin, 1983a, b); and these methods have been successfully applied to the mainstreamed class (Madden & Slavin, 1983b). In the context of individualized instruction, the use of team checking and helping frees the teacher from most routine management tasks, enabling him or her to spend most of class time teaching groups of students performing at the same level (drawn from

the heterogeneous learning teams). This essential direct instruction is lacking in most previous individualized models, in which teachers typically must spend most of class time checking student work, managing materials, and giving very brief explanations to individual students.

For mainstreamed academically handicapped students, the TAI process not only provides instruction at students' appropriate levels, it also engages students in cooperative activities with heterogeneous peers. Because team success is based on units completed regardless of which units students are working on, low achieving students have as good a chance as their higher-performing teammates to contribute to the team's success. This is probably one reason why academically handicapped students were so well accepted by their peers and came to behave like their peers in the TAI classes (Slavin, Madden, & Leavey, 1984b).

As important as mathematics is in the elementary school curriculum, it is secondary to reading and writing. If elementary schools are to be organized to be fully adaptive to the needs of heterogeneous groups of students, then effective methods must also be found to incorporate a wide range of student performance levels in reading and writing. This was the goal with which the current project began: to apply what we had learned in the studies of the TAI math program to instruction in reading, language arts, and writing.

Our objectives in the reading/writing project were similar to those of the mathematics project: to develop and evaluate a complete reading/writing program for the upper elementary grades which would meet the needs of heterogeneous classes, so that academically handicapped students could remain in the mainstream and still have their unique needs met. As in the mathematics research, we began with an assumption that the program we developed had to be more effective than traditional instruction for non-handicapped students as well; otherwise, regular educators probably would not use the program.

The nature of reading, language arts, and writing and the characteristics of traditional instruction in these areas are quite different from mathematics. Reading and writing objectives are made up of many subobjectives which differ radically from one another. For example, instructional approaches that are effective for teaching decoding or spelling or language mechanics may not be applied to teaching reading comprehension, vocabulary, or composition. Also, within-class ability grouping (i.e., reading groups) is used in most elementary reading instruction, making teaching strategies in this subject more complex.

We spent eighteen months developing, piloting, and revising experimental procedures to teach reading effectively in heteregeneous classrooms. We initially specified reading as our sole focus. But as we proceeded with the development activities, we found that it was critical to take on language arts and writing as well, on the basis that these subjects should not be separated from reading. For

this reason and others, the ultimate form of the program was quite different from that which was originally anticipated.

The program in its final form is called Cooperative Integrated Reading and Composition, or CIRC. The CIRC program is designed for use by a teacher without aides or co-teachers. While it uses students' existing basal texts, it replaces all other materials in reading and language arts, such as workbooks and language arts texts, with materials especially developed for the project.

The principal features of the CIRC program and brief rationales for each appear below. Following this description, we present the results of one 12-week study and one 24-week study which evaluated the effects of CIRC on student achievement and other outcomes.

Rationale and Overview: Cooperative Integrated Reading and Composition (CIRC)

The CIRC program consists of three principal elements: Basal-related activities, direct instruction in reading comprehension, and integrated language arts/writing. In all these activities, students work in heterogeneous learning teams. All activities follow a regular cycle that involves teacher presentation, team practice, peer pre-assessment, additional practice, and testing.

Reading Groups. Students are assigned to reading groups according to their reading level, as determined by their teachers.

Teams. Students are assigned to pairs (or triads) within their reading groups, and then the pairs are assigned to teams composed of partnerships from two reading groups. For example, a team might be composed of two students from the top reading group and two from the low group. Mainstreamed academically handicapped and remedial reading (e.g., Chapter I) students are evenly distributed among the teams. Students' scores on all quizzes, compositions, and book reports are contributed to form a team score. Teams that meet an average criterion of 95% on all activities in a given week are designated "superteams" and receive attractive certificates; those which meet an average criterion of 90% are designated "greatteams" and receive smaller certificates. As noted earlier, research on the use of heterogeneous teams which are rewarded on the basis of their members' learning has established the instructional effectiveness of this approach (Slavin, 1983a,b).

Basal-Related Activities. Students use their regular basal readers. Basal stories are introduced and discussed in teacher-led reading groups that meet for 20-30 minutes each day. During these groups, teachers set a purpose for reading, introduce new vocabulary, review old vocabulary, discuss the story after students have read it, and so on. Presentation methods for each segment of the lesson are structured. For example, teachers are taught to use a vocabulary presentation procedure that requires a demonstration of understanding of word meaning by each individual, a review of

methods of work attack, and repetitive oral reading of vocabulary to achieve fluency. Story discussions are structured to emphasize such skills as making and supporting predictions and identifying the problem in a narrative.

After stories are introduced, students are given a story packet which lays out a series of activities for students to do in their teams when they are not working with the teacher in a reading group. The sequence of activities is as follows:

a. Partner Reading. Students take turns reading the story aloud with their partners, alternating readers after each paragraph. They read the same story twice, correcting one another's errors. Repeated reading has been found to contribute to decoding and to comprehension of narratives (Dahl, 1979). Also, the partner reading gives students a great deal of oral reading practice, and enables the teacher to assess student performance (by listening in) without having students read aloud in their reading group, wasting the time of the other students in the group.

b. Story Grammar and Story Related Writing. Students are given questions related to each narrative story that emphasize the story grammar. Halfway through the story, they are instructed to stop reading and to identify the characters, the setting, and the problem in the story, and to predict how the problem will be resolved. At the end of the story students respond to the story as a whole and write a few paragraphs on a topic related to the story (for example, they might be asked to write a different ending to the story). Research on reading comprehension has indicated the importance of

students' learning story grammars (Fitzgerald & Spiegel, 1983; Meyer, 1977; Stein & Glenn, 1977) and of making predictions based on partial information about stories (Palincsar & Brown, 1984).

c. Words Out Loud. Students are given a list of new or difficult words used in the story which they must be able to read correctly in any order without hesitating or stumbling. Students practice these word lists with their partners or other teammates until they can read them smoothly. This activity helps students gain automaticity in decoding critical words (Rosenshine & Stevens, 1986; Samuels, 1981).

d. Word Meaning. Students are given a list of story words which are new in their speaking vocabularies and asked to look them up in a dictionary, paraphrase the definition, and write a sentence for each that shows the meaning of the word (i.e., "An octopus grabbed the swimmer with its eight long legs," not "I have an octopus.")

e. Story Retell. After reading the story and discussing it in their reading groups, students summarize the main points of the story to their partners. Summarizing recently read material for a peer has been found to enhance comprehension and retention of the material (Dansereau, 1985).

f. Spelling. Students pretest one another on a list of spelling words each week, and then work over the course of the week to help one another master the list. Students use a "disappearing list" strategy in which they make new lists of missed words after each assessment until the list disappears and they can go back to the

full list, repeating the process as many times as necessary.

Partner Checking. After students complete each of the activities listed above, their partners initial a form on the cover of the story packet indicating that they have completed and/or achieved criterion on that task. Students are given daily expectations as to the number of activities to be completed, but they can go at their own rate and complete the activities earlier if they wish, creating additional time for independent reading (see below).

Tests. At the end of three class periods, students are given a comprehension test on the story, are asked to write meaningful sentences for each vocabulary word, and are asked to read the word list aloud to the teacher. Students cannot help one another on these tests. The test scores and evaluations of the story related writing are major components of students' weekly team scores.

Direct Instruction in Reading Comprehension. One day each week, the teacher provides direct instruction in reading comprehension skills, particularly finding main ideas, using a step-by-step curriculum designed for this purpose. After each lesson, students work on reading comprehension worksheets and games as a whole team, first gaining consensus on one set of worksheet items and then assessing one another and discussing any remaining problems on a second set of items. Recent research indicates that reading comprehension can be effectively taught as a skill separately from basal instruction (e.g., Palinscar & Brown, 1984; Paris, Lipson, & Wixson, 1983; Stevens, in press).

Integrated Language Arts and Writing. During language arts periods, teachers use a specific language arts/writing curriculum especially developed for the project. In it, students work as teams on language arts skills which lead directly to writing activities. This curriculum emphasizes writing, and language mechanics skills are introduced as specific aids to writing rather than as separate topics. For example, students study modifiers and then write descriptive paragraphs emphasizing their use, and study quotation marks before writing dialogue. On all writing assignments students draft compositions in consultation with peers, and then edit one another's work using peer editing forms that emphasize both the content of the composition and its grammatical and mechanical correctness. Students then revise their completed compositions on the basis of this peer feedback. The peer editing forms begin simply, but become more complex as students cover successive skills. Writing process models that use peer response groups and a sequence of planning, drafting, editing, and revision have been found to be effective in previous research (Hillocks, 1984), although little of this research has been done at the elementary level.

Independent Reading. Students are asked to read a trade book of their choice each evening for at least twenty minutes. Parents initial forms indicating that students have read the required time, and students contribute points to their teams if they submit a completed form each week. Students also complete at least one book report every two weeks, for which they also receive team points. Independent reading and book reports replace all other homework in reading and language arts. If students complete their story packets

or other activities early, they may read their independent reading books in class.

Involvement of Special Education Resource Teachers and Reading Teachers. One key concern in the design of the CIRC program was to fully integrate the activities of special education resource teachers and remedial reading teachers with those of the regular classroom teachers. "Remedial reading" refers here both to Chapter I reading programs and to LEA-funded remedial programs, which were organized similarly to Chapter I. Originally we had hoped to have regular and special/remedial teachers work in the same classrooms as co-teachers, but in neither of the two studies conducted to evaluate CIRC was this possible to arrange. Instead, two quite different approaches were taken in the two field experiments which evaluated CIRC.

In the first study, resource teachers and reading teachers pulled students out of their reading classes for part or all of the reading period, and implemented the CIRC program in separate areas. The special education students were paired with one another, as were remedial reading students, so that students were in the same pairs in the regular class as they were in their pullout class. Special education students were pulled out for most or all of the reading period. Remedial reading students were taken out of class for 30-40 minute periods during reading time. Special education and remedial reading teachers were trained along with the regular teachers in the CIRC procedures, and were then asked to use the procedures as much as possible during the pullout periods. Essentially, this meant

that students just picked up their work and moved to a new location to do it, except that they had more individual adaptive assistance. Pullout procedures were the same in the control classes as in the experimental classes, except that special and remedial teachers in the control group did not use the CIRC materials and procedures and made no special attempts to coordinate their instruction with that being delivered in the regular classes.

In the second study, the schools involved scheduled resource and remedial reading pullouts at times other than reading or language arts/writing periods. Special and remedial reading teachers attended the CIRC training sessions but did not use CIRC methods or materials in their pullout programs, except that they occasionally helped students with problems they were encountering in the CIRC program being used in the regular class. In control schools, special and remedial students were usually pulled out of reading periods for resource or remedial instruction in reading.

The two studies conducted to evaluate the CIRC program are described in the following section.

Study 1: Methods

Subjects and Design

The subjects in Study 1 (Madden, Stevens, and Slavin, 1986) were 461 third- and fourth-grade students in 21 classes in a suburban

Maryland school district. Twenty-two of these students were diagnosed as learning disabled and were receiving special education resource services, and an additional fifty-one were receiving remedial reading instruction. The eleven experimental classes in six schools were matched on California Achievement Test Total Reading scores with ten classes in four control schools. Experimental and control teachers volunteered to participate in the study. The treatments were implemented over a 12-week period during the spring semester, 1985. All the teachers in each grade allocated the same amount of time for reading and language arts/writing instruction. Third grades allocated two hours to reading and 45 minutes to language arts per day, and fourth grades allocated 90 minutes to reading and 60 minutes to language arts per day.

Treatments

Control. The control teachers continued using their traditional methods and curriculum materials. In reading, this usually consisted of using basal series in three reading groups, with workbook and worksheet activities for follow-up time. In language arts and writing, fourth grade teachers typically used whole-class instruction. Many of the teachers used published language arts programs for a portion of this instruction. However, approximately half of the third grade teachers used two or three ability groups for part of their language arts and writing instruction. Third grade teachers also used published language arts programs for a portion of their instruction. In spelling, both the control and experimental

teachers used a published spelling program, with daily lessons and weekly tests, but the control teachers used their traditional classroom process during spelling instruction. Students in resource and remedial reading programs were pulled out of reading class for part or all of the reading period.

Cooperative Integrated Reading and Composition (CIRC). The experimental teachers were trained in the CIRC program as described above. The training consisted of two three-hour sessions, and the teachers received a detailed teacher's manual. As noted earlier, special education students were pulled out of reading class for part or all of the reading period but used the CIRC procedures in the resource room. Remedial reading students were pulled out of reading periods for 30-40 minute sessions and also continued their CIRC activities with their reading teachers. During the initial weeks of implementation, the teachers were observed by project staff who provided feedback concerning their implementation and answered questions from the teachers. The project staff continued monitoring the CIRC teachers' implementation at random intervals throughout the entire study.

Measures

Achievement Pretests. To adjust for students' initial performance levels, standardized test scores from district records were used as statistical adjustments in all analyses. The scores used were Total Reading and Total Language scale scores from the California Achievement Test. These were administered during the fall of grade 3, meaning that while third graders' pretests were recent,

fourth graders' were a year old. The pretest scores were transformed to z-scores separately for each grade so that data from both grades could be combined. In addition, writing samples administered at the start of the experiment were used as statistical adjustments in addition to Total Reading and Total Language in all analyses of writing posttests.

Standardized Posttests. At the end of the experiment, all students were administered the Reading Comprehension, Reading Vocabulary, Spelling, Language Expression, and Language Mechanics scales of the California Achievement Test, Form D. Third graders took Level 14 and fourth graders took Level 15. Raw scores from these scales were transformed to z-scores separately for each grade to enable combining scores across grades.

Writing Samples. At pre- and post-testing, students were asked to complete a writing sample in response to probes designed to give them a specific audience and purpose for writing. The probes used were adapted from those developed and field tested for the California State Department of Education by a panel of writing experts led by Doris Prater of the University of Houston. The pre- and post-test probes are presented below.

Pretest Probe:

> IMAGINE THIS. Your teacher has decided to have the class take a field trip this spring. Your teacher has asked all of the students in the class to make suggestions about where to go on the trip. Select a place that you think your class would like to visit for a day. Write a note to your teacher. Give the name of the place you have picked. Tell the reasons you think it is a good place for a field trip.

Posttest Probe:

IMAGINE THIS. You have met a girl from China near your school. She speaks English, but she does not know anything about schools in America. Tell her about your school building. Tell her how the building looks on the outside and inside. Tell her about your teacher and your classmates.

The classroom teacher was asked to read the probes to the class to make sure that all students understood the task.

The probes were scored using an analytic scoring procedure which was developed as the probes were designed and field-tested. Analytic as opposed to holistic scoring procedures were used so that content and mechanics skills in writing could be separately assessed. Each sample was scored on a scale from 1 to 3 on two content variables, ideas and organization, and on mechanics skills such as punctuation/capitalization, spelling, usage/word choice, and syntax. Scores on the mechanics skills were combined to form one scale.

Four raters, uninformed as to the purpose or design of the experiment, scored pretest and posttest samples on each of these variables. Because of the time-consuming nature of the scoring procedures, only one sample in four was scored, with the first, fifth, ninth, etc. students in alphabetical order in each class serving as a subsample for the writing analyses. However, writing samples of all special education and remedial reading students were scored and used in analyses relating to these students. Each writing sample was rated by two raters. After the individual ratings were made, the two raters conferred, discussing and resolving any differences. The agreed upon scores formed the data. Raters were individually trained in the use of the analytic scoring system until their scores matched established ratings for the

training essays 95% of the time on each variable. Training took approximately three hours. Reliability assessments, made at three points during the rating period, produced estimates ranging from .83 to .97, with a mean reliability of .94.

Study 1: Results

Implementation

Observations revealed that all experimental teachers implemented each of the components of the CIRC program throughout the study.

Analyses

For the full sample analyses, posttests were analyzed by adjusting for Total Reading and Total Language pretests. The adjusted scores were then used as dependent variables in random effects, nested analyses of variance which are essentially equivalent to class-level analyses (Glass & Stanley, 1970; Hopkins, 1982). The writing sample scores were analyzed in a similar fashion, but included writing sample pretest scores along with Total Reading and Total Language in the adjustment. The nested analyses tested the mean square for treatment against that for classes within treatments, with degrees of freedom associated with the number of classes, not the number of students. For analyses involving special education and remedial reading students, individual level ANOVA's were computed using the same adjusted scores.

Pretests

As noted earlier, experimental and control classes were initially matched on California Achievement Test Total Reading scores. No pretest differences were found on this variable. However, individual-level analyses of variance revealed statistically significant pretest differences on Total Language ($F=9.13$, $p<.003$) and on the pretest writing samples for Mechanics ($F=10.61$, $p<.002$). Both of these differences favored the control group.

Standardized Posttests

The class-level analyses of the full samples involved in the study found statistically significant differences favoring the experimental group on four of the five standardized tests -- Reading Comprehension ($F=4.85$, $p<.040$), Reading Vocabulary ($F=4.62$, $p<.045$), Language Expression ($F=4.45$, $p<.048$) and Spelling ($F=11.29$, $p<.003$). These results are summarized in Table 1. Effect sizes for each measure were computed as the difference between the adjusted experimental and control posttest means divided by the control group's unadjusted posttest standard deviation. The effect sizes of the significant results range from .175 to .286 standard deviations. Table 1 also presents estimated grade equivalent differences between experimental and control groups, after adjustments for pretests. These estimates were derived using norms from technical bulletins for the California Achievement Test. They show adjusted differences of 30% to 72% of a grade equivalent for the statistically significant differences on standardized measures.

Tables 1, 2, 3 and 4 Here

Table 2 presents the results of the individual level analyses of variance that assess treatment effects for the special education and remedial reading students. Treatment effects did not approach statistical significance on any of the standardized posttest variables for either subgroup.

Writing Samples

Table 3 summarizes the treatment effects for the full sample on the writing samples. Statistically significant differences favored the experimental group in Organization ratings ($F=6.29$, $p<.021$). No differences were found for Mechanics, paralleling the results for the standardized Language Mechanics scales, or for Ideas ratings. Table 4 presents writing sample data for the remedial reading subsample only, as a high proportion of missing data made analyses for special education students impossible. No effects on writing were found for the remedial reading students.

Study 2: Methods

The second study was planned as a replication and extension of the first, using similar processes and curricula with revisions suggested by feedback and experience from Study 1. Study 2 differed from the first study principally in duration, and in the organiza-

tion of special education resource and remedial reading pullouts. The duration of the study was 24 weeks, as opposed to 12 in the initial study. It was hoped that with a longer treatment, the positive achievement effects seen for the full sample in Study 1 would also extend to the special and remedial reading students. Also, in Study 1 these students did not receive their primary reading instruction in the regular class, which deprived them of the hypothesized benefits of working in heterogeneous, cooperative teams. In Study 2, pullouts during readings and language arts periods were discontinued for all special and remedial reading students.

Subjects and Design

The subjects were 450 third- and fourth-grade students in 22 classes in a suburban Maryland school district. Twenty-two students had been diagnosed as learning disabled and ninety-four were receiving remedial reading services. The nine experimental classes in four schools were matched on California Achievement Test scores for Total Reading and Total Language with thirteen control classes in five schools. There was also an attempt to control for ethnic and socio-economic background of the students by selecting matched classes from schools in the same or similar neighborhoods. Both experimental and control teachers volunteered to participate in the study. The treatments were implemented from October to March in the 1985-86 school year. The school district allocated two hours per day for reading in third grade, one hour per day in fourth grade, and one hour per day for language arts and writing in both third and fourth grade.

Treatments

Control. The control teachers continued using their traditional methods and curriculum. In reading, this consisted of two or three reading groups in a basal series, with workbooks and worksheets used as follow-up activities. In language arts and writing, the teachers used whole-class instruction and often used published language arts programs. Special education resource and remedial reading programs were usually organized as pull-outs from reading periods.

Cooperative Integrated Reading and Composition (CIRC). The experimental teachers were trained in the CIRC program essentially as described above. Revisions were made, however, in the teacher-directed instruction in reading comprehension and language arts/writing. In reading comprehension, the teachers were provided with more specific instructions and examples for teaching the particular skills, in order to improve the quality of their initial instruction. All other processes and activities in reading comprehension remained the same as in Study 1.

The process used for the language arts/writing component of the program was changed to increase the amount of writing students were involved in and the amount of feedback they received on their writing from peers as well as teachers. During three one-hour sessions a week students participated in a writer's workshop, writing at their own pace on topics of their choice. Teachers presented 10-minute mini-lessons at the beginning of each session on

topics of writing process, style, or mechanics, such as brainstorming for topics, conducting a peer revision conference, eliminating run-on sentences, and using quotations. Students spent the main part of the hour planning, drafting, revising, editing and publishing their writing. Informal and formal peer and teacher conferences were held during this time. Ten minutes at the end of the hour were reserved for sharing and "celebration" of student writing. Teacher-directed lessons on specific aspects of writing -- such as organizing a narrative or a description, using specific sensory words in a description, and insuring noun-verb agreement -- were conducted during two one-hour sessions per week.

The experimental teachers were trained in two three-hour sessions. They also received a detailed teacher's manual for the program. Special education resource teachers and remedial reading teachers attended the training sessions so that they would be aware of what was happening in the regular classes, but they did not use the CIRC materials or procedures. Pullout schedules were set up so that students were never pulled out of reading or language arts/ writing for resource or remedial reading instruction.

Teachers were observed by project staff during the initial stages of implementation, and the staff provided feedback and guidance to the teachers in helping them resolve any problems. The project staff continued to monitor the teachers' implementation at random intervals throughout the study.

Measures

Achievement Pretests. Standardized test scores from district records were used as pretest adjustments in all analyses. The scores were Total Reading and Total Language scale scores from the California Achievement Test. As in the first study, these tests were administered by the district during the fall of third grade, so the fourth graders' pretests were a year old. The pretests were transformed to z-scores for each grade so the data from both grades could be combined. Also, writing samples were administered as pretests and used with Total Reading and Total Language as adjustments in the analyses of the writing sample posttests.

Standardized Posttests. At the end of the experiment the students were administered the Reading Comprehension, Reading Vocabulary, Language Expression and Language Mechanics subtests of the California Achievement Test, Form D. Third graders were given Level 14 and fourth graders were given Level 15. As in the first study, the raw scores for each subtest were transformed to z-scores by grade, to enable combining scores across grades.

Writing Samples. Students were asked to complete a writing sample during pre- and posttesting, similar to the procedure used in the first study. The pretest and posttest probes are presented below.

Pretest Probe:

IMAGINE THIS. Your teacher has decided to have the class take a field trip this spring. Your teacher has asked all of the students in the class to make suggestions about where to go on the trip. Select a place that you thihk your class would like to visit for a day. Write a note to your teacher. Give the name of the place you have picked. Tell the reasons you think it is a good place for a field trip.

Posttest Probe:

PRETEND that you have a friend in Florida who is your age. Your friend has never seen snow! Write a letter to your friend in Florida. See if you can give your friend a really clear idea of what snow is like so that he or she can almost see it and feel it. Tell your friend about some of the fun things you have done in the snow this winter.

The writing samples were scored using the analytic approach described in the first study. Each sample was scored on two content variables, ideas and organization, and on mechanics skills such as punctuation/capitalization, spelling, usage/word choice, and syntax. Scores on the mechanics skills were combined to form one scale.

As in the first study, a subset of the project classes were scored, except that all special and remedial students' writing samples were scored for analyses that involved these students. Each sample was rated by two trained raters. After rating the sample individually, the raters conferred and arrived at a consensus score which was used in the final analyses. Reliability checks were conducted at three points during the rating period. Reliability estimates of the individual scales ranged from from .80 to .94, with a mean reliability of .87.

Informal Reading Inventories. At the end of the study a sample of the students in the experimental and control classes were

administered the word lists and oral reading passages of the Durrell Analysis of Reading Difficulty (Durrell & Catterson, 1980). The word lists were used to measure students' word recognition and word analysis skills. The students were also asked to read paragraphs orally and raters recorded the time required, miscues, and comprehension scores for the paragraphs. Both the word lists and oral paragraphs were administered as directed in the manual which accompanies the Durrell inventory. On the word lists, the interrater reliability (percent agreement) for the three raters ranged from 93.3% to 97.8%, with a mean of 95.2%. The interrater reliability on the oral paragraphs ranged from 95% to 100% for the miscue analysis, and from 90% to 100% on the comprehension measure.

To select students for this subsample, individual experimental and control classrooms were matched on Total Reading pretest scores. Then students in the experimental classrooms were individually matched with students in the control classroom. From this list of matched pairs, six pairs of students were randomly selected -- two pairs from the top third, two pairs from the middle, and two pairs from the bottom third of the class. This random selection of matched pairs provided a representation of all levels of students in each classroom.

Study 2: Results

Implementation

As in Study 1, observations revealed that all experimental teachers consistently implemented all of the components of the CIRC program throughout the study.

Analyses

For analyses of the full sample of students, standardized posttests and the informal reading inventory measures were adjusted for Total Reading and Total Language pretests. The adjusted scores were then used as dependent variables in random effects, nested analyses of variance. Writing sample posttest measures were similarly analyzed, with the writing sample pretest measures added to the adjustment. As in the first study, the analyses nested classes within treatment, and used degrees of freedom related to the number of classes, thereby providing a measure of class-level effects. Analyses relating to special and remedial reading students were conducted at the individual level.

Pretests

As described previously, experimental and control classes were matched on California Achievement Test scores on Total Reading. Analyses of pretests found no differences between the groups on either Total Reading or Total Language. Similarly, comparisons of the scores on the writing sample premeasures indicated no initial differences. The experimental and control group students used for

the informal reading inventory posttest measures also had no significant pretest differences.

Standardized Posttests

The class-level analyses of data from the full sample found significant differences favoring the experimental group on the subtests for Reading Comprehension ($F=12.86$, $p<.002$), Language Expression ($F=4.76$, $p<.042$), and Language Mechanics ($F=7.57$, $p<.012$). These results are summarized in Table 5. The effect sizes for these measures range from .29 to .35 standard deviations, or .64 to .66 grade equivalents.

Tables 5, 6, 7 and 8 Here

Table 6 presents data for the special education and remedial reading subsamples. Despite the small samples involved, special education students significantly exceeded control in adjusted reading vocabulary scores ($F=4.72$, $p<.046$), and marginally significantly exceeded control in reading comprehension ($F=3.66$, $p=.074$). Effect sizes favoring the experimental groups were substantial, 1.02 standard deviations in reading comprehension and .87 standard deviations in reading vocabulary, or 1.92 and 1.44 grade equivalents, respectively. However, no differences were found for special students on language mechanics or language expression scales. For remedial reading students, marginally significant positive effects

were found on reading comprehension, language mechanics, and language expression scales. Again, effect sizes ranged from .30 to .38, and grade equivalent differences from .66 to .80.

Writing Samples

The class-level analyses on the writing samples indicate a nearly significant effect on the measure of ideas ($F=4.28$, $p=.052$) in favor of the experimental group (effect size = .31). The two other writing measures indicated no significant differences. These results are presented in Table 7. None of the effects on the writing samples for special or remedial reading students were statistically significant (Table 8).

Informal Reading Inventory

The results of the class level ANCOVA on the oral reading measures indicate significant effects for the full sample on word recognition ($F=12.73$, $p<.003$), word analysis ($F=10.54$, $p<.006$), grade placement ($F=5.59$, $p<.033$), time on a common paragraph ($F=7.05$, $p<.019$), and number of errors on a common paragraph ($F=7.26$, $p<.017$). All these effects favor the experimental students. The results are summarized in Table 9. The effect sizes on these oral reading measures range from .44 to .64 standard deviations.

Tables 9, 10 Here

To examine program effects for the lowest-achieving students, separate individual-level analyses of oral reading measures were conducted for students from the lowest third of each class, as the numbers of special and remedial reading students given these measures was too small for separate analysis. These results, summarized in Table 10, show that effects on word recognition and time on a common paragraph were substantial and significant. Marginally significant effects were also found for grade placement. Effect sizes for these measures ranged from .48 to 1.25.

Discussion

The results of these two field experiments support the effectiveness of the CIRC program in producing significantly better reading and writing achievement for third- and fourth-grade students. The consistency, breadth and magnitude of these effects underscore the importance of the differences in favor of CIRC classrooms. In reading, the standardized achievement results are further supported by the measures of students' oral reading skills, as indicated by the informal reading inventory results. The second study did not replicate the significant effects on vocabulary found in the first study, but both studies did show effects in favor of CIRC on this variable (ES = .175 and .121 standard deviations, respectively). Taken together, the two studies indicate that the CIRC procedures increase all three of the major components of reading proficiency -- decoding, comprehension, and vocabulary.

The results for the full samples in language arts and writing were less consistent, but still important. In both studies students

in CIRC gained substantially on language expression measures, both on standardized tests and on the writing samples. No significant differences were found in the first study on language mechanics, but the second found strong effects on this variable in favor of the CIRC classrooms (ES = .123 and .302 respectively). This result may be due to an improved integration of the language mechanics goals into the writing process during the longer term intervention of the second study. Finally, students' achievement in spelling produced substantial effects favoring CIRC in the first study. The standardized spelling test was not used as a dependent measure in the second study because of time constraints.

The significant effects on the informal reading inventories provide strong support for the partner reading and partner word practice activities used in CIRC. The partner reading provides students with a great deal of practice reading orally, which improves fluency in reading for CIRC students as measured by the grade placement, time, and error measures on the Durrell inventory. These results are not surprising given recent observational data on reading activities in second grade which showed that, on the average, students spent only 1 1/2 minutes a day reading orally from basal texts (Thurlow, Groden, Ysseldyke and Algozzine, 1984). The increased practice on oral reading produced by the partner reading component of CIRC seems to produce greater automaticity in decoding and greater reading fluency, which is particularly important for students who are having reading problems. Descriptive research on students with reading deficits consistently finds that these students lack proficiency in decoding (Perfetti, 1985). Typically,

these decoding problems contribute to poorer comprehension, as these students skip words they don't know and they concentrate on decoding words rather than understanding the meaning of the text. Thus, the development of decoding automaticity and reading fluency are an important means to improving reading comprehension for students with diagnosed reading deficits.

The results of the two studies differed for mainstreamed special education students. In Study 1, effects on reading and spelling scores were in the same direction as for the full sample, but did not approach statistical significance. However, in Study 2, effects on reading vocabulary and comprehension were substantial. Neither study found effects on standardized language arts measures or on writing samples. The pattern was similar for students receiving remedial reading services. No effects were found in Study 1, but Study 2 found marginally significant but substantial positive effects on reading comprehension, language mechanics, and language expression measures. Substantial positive effects on oral reading measures for students in the lowest third of each class further confirm that the form of the CIRC program evaluated in Study 2 was highly effective for low ability readers.

The striking differences in the outcomes of the two studies for mainstreamed special education and remedial reading students may have occurred because of differences in the study durations; Study 2 covered 24 weeks, twice as long as Study 1. For the small sample sizes involved, producing a statistically significant effect on standardized reading achievement measures requires a great impact on

student achievement levels -- greater than that which could be produced in only twelve weeks.

However, there is another possible explanation for the different outcomes. The special and remedial reading students in Study 2 received instruction entirely in the regular class, participating as full members of cooperative, heterogeneous learning teams. Theories of cooperative learning (see Slavin 1983a, b) emphasize the importance of students working in heterogeneous teams toward common goals. The pullout procedures used in Study 1 deprived special and remedial reading students of an opportunity to work over extended periods in cooperative heterogeneous groups, while in Study 2 these students received the benefit of the help, encouragement, and acceptance of their non-handicapped teammates.

The difficulty in interpreting studies of a complex program is that any number of the components of the program could account for the effects. For example, the effects of the CIRC program on reading comprehension and reading vocabulary may be due to activities related to the basal stories (such as teaching story grammars, partner reading, mastery-oriented story comprehension practice), to having students work in cooperative heterogeneous teams, to direct instruction in comprehension strategies, or to the daily 20-minute independent reading component. To better understand each of these components and their impact on students' achievement, future research on the CIRC model will conduct component analyses (see Slavin, 1984b) to isolate the unique effects of each of the major program components.

The present study demonstrates most clearly that when state-of-the-art principles of classroom organization, motivation, and instruction are used in the context of a cooperative learning program, student achievement in reading, language arts, and writing can be increased. These effects can be substantial for mainstreamed special education and remedial reading students if these students remain in the regular classroom to work cooperatively with their non-handicapped classmates. However, a long road lies ahead to refine the methods and to understand the separate effects of the program's component parts.

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Table 1
Standardized Achievement Measures, Full Sample
Study 1

	CIRC		CONTROL		ANOVA's (d.f.=1,459)	
	$\bar{x}$	(SD)	$\bar{x}$	(SD)	F	p
PRETESTS						
Total Reading	-.06	(.94)	.05	(1.05)	1.38	ns
Total Language	-.14	(.94)	.14	(1.03)	9.13	.003
POSTTESTS						
Reading Comprehension	.05	(.97)	-.04	(1.03)		
Reading Vocabulary	.02	(.98)	-.02	(1.02)		
Language Expression	.06	(1.01)	-.05	(.99)		
Language Mechanics	-.01	(1.02)	.01	(.98)		
Spelling	.09	(1.03)	-.08	(.97)		
ADJUSTED POSTTESTS						
Reading Comprehension	.10	(.70)	-.10	(.67)		
Reading Vocabulary	.09	(.67)	-.09	(.64)		
Language Expression	.12	(.70)	-.12	(.72)		
Language Mechanics	.06	(.80)	-.06	(.73)		
Spelling	.14	(.79)	-.14	(.75)		
N	225		236			

CLASS-LEVEL ANALYSES (d.f.=1,19)

	F	p	Effect Size
POSTTESTS			
Reading Comprehension	4.85	.040	+.190
Reading Vocabulary	4.62	.045	+.175
Language Expression	4.45	.048	+.240
Language Mechanics	1.44	ns	+.123
Spelling	11.29	.003	+.286

ADJUSTED POSTTESTS IN GRADE EQUIVALENTS

	CIRC	CONTROL	Difference
Reading Comprehension	6.00	5.64	+.36
Reading Vocabulary	5.77	5.47	+.30
Language Expression	5.96	5.44	+.52
Language Mechanics	6.25	5.99	+.26
Spelling	6.25	5.53	+.72

Table 2

Standardized Achievement Measures,
Special and Remedial Reading Students
Study 1

	Special Students				Remedial Reading Students			
	CIRC		Control		CIRC		Control	
	$\bar{x}$	(SD)	$\bar{x}$	(SD)	$\bar{x}$	(SD)	$\bar{x}$	(SD)
PRETESTS								
Total Reading	-1.54	(.88)	-1.90	(.55)	-1.27	(.53)	-1.22	(.57)
Total Language	-1.95	(.94)	-1.58	(.63)	-1.19	(.36)	-1.06	(.73)
POSTTESTS								
Rdg. Comprehension	-1.33	(.67)	-1.64	(.47)	- .89	(1.00)	-1.04	(.66)
Rdg. Vocabulary	-1.63	(1.11)	-1.73	(.70)	-1.21	(.82)	-1.18	(.71)
Lang. Expression	-1.65	(1.35)	-1.77	(.79)	-1.02	(1.04)	- .77	(.81)
Lang. Mechanics	-1.41	(.86)	-1.19	(.92)	- .57	(1.14)	- .82	(.88)
Spelling	-1.03	(.85)	-1.51	(1.03)	- .93	(.96)	- .88	(.64)
ADJUSTED POSTTESTS								
Rdg. Comprehension	- .12	(.66)	- .26	(.48)	- .06	(.87)	- .15	(.61)
Rdg. Vocabulary	- .31	(.87)	- .30	(.63)	- .22	(.70)	- .25	(.71)
Lang. Expression	- .40	(.82)	- .46	(.72)	- .11	(.83)	- .09	(.70)
Lang. Mechanics	- .22	(.63)	- .01	(.76)	.27	(1.05)	- .04	(.78)
Spelling	.07	(.68)	- .33	(.88)	- .11	(.73)	- .10	(.70)
N	10		12		14		35	

INDIVIDUAL-LEVEL ANCOVA's

	F	p	F	p
POSTTESTS				
Rdg. Comprehension	<1	ns	<1	ns
Rdg. Vocabulary	<1	ns	<1	ns
Lang. Expression	1.13	ns	<1	ns
Lang. Mechanics	1.12	ns	1.02	ns
Spelling	<1	ns	<1	ns

Table 5
Writing Sample Measures, Full Sample
Study 1

	CIRC		CONTROL		ANOVA's (d.f.=1,156)	
	$\bar{x}$	(SD)	$\bar{x}$	(SD)	F	p
PRETESTS						
Total Reading	-.06	(.93)	.06	(1.07)	<1	ns
Total Language	-.23	(.92)	.23	(1.02)	7.68	.007
Organization	1.77	(.62)	1.88	(.61)	<1	ns
Ideas	2.05	(.53)	2.11	(.56)	<1	ns
Mechanics	2.25	(.56)	2.54	(.46)	10.61	.002
POSTTESTS						
Organization	2.14	(.74)	1.89	(.68)		
Ideas	2.00	(.70)	1.93	(.68)		
Mechanics	2.26	(.50)	2.34	(.47)		
ADJUSTED POSTTESTS						
Organization	2.19	(.68)	1.84	(.64)		
Ideas	2.04	(.62)	1.89	(.65)		
Mechanics	2.31	(.44)	2.29	(.42)		
N	74		84			

CLASS-LEVEL ANALYSES (d.f.=1,19)

	F	p	Effect Size
POSTTESTS			
Organization	6.29	.021	+.507
Ideas	<1	ns	+.212
Mechanics	<1	ns	+.034

Table 4

Writing Sample Measures, Remedial Reading Students
Study 1

	CIRC		CONTROL	
	$\bar{x}$	(SD)	$\bar{x}$	(SD)
PRETESTS				
Reading Total	-1.22	(.53)	-1.47	(.61)
Language Total	-1.19	(.39)	-1.35	(.77)
Ideas	2.20	(.48)	2.22	(.45)
Organization	1.85	(.63)	2.00	(.48)
Mechanics	1.95	(.60)	2.42	(.49)
POSTTESTS				
Ideas	1.85	(.63)	1.76	(.50)
Organization	1.50	(.47)	1.72	(.56)
Mechanics	1.96	(.47)	2.20	(.48)
ADJUSTED POSTTESTS				
Ideas	2.01	(.56)	1.95	(.52)
Organization	1.71	(.48)	1.92	(.42)
Mechanics	2.21	(.54)	2.30	(.38)
N	10		23	

INDIVIDUAL-LEVEL ANCOVA's	F	p
POSTTESTS		
Ideas	<1	ns
Organization	1.82	ns
Mechanics	<1	ns

Table 5
Standardized Achievement Measures, Full Sample
Study 2

	CIRC		CONTROL		ANOVA's (d.f.=1,445)	
PRETESTS	$\bar{x}$	(SD)	$\bar{x}$	(SD)	F	p
Total Reading	-.08	(1.08)	.05	(.94)	1.89	ns
Total Language	-.09	(1.07)	.06	(.95)	2.89	ns
POSTTESTS						
Reading Comprehension	.17	(1.00)	-.11	(.99)		
Reading Vocabulary	.02	(1.02)	-.01	(.99)		
Language Expression	.15	(1.01)	-.10	(.98)		
Language Mechanics	.14	(1.06)	-.08	(.96)		
ADJUSTED POSTTESTS						
Reading Comprehension	.23	(.70)	-.12	(.74)		
Reading Vocabulary	.10	(.77)	-.02	(.72)		
Language Expression	.20	(.71)	-.09	(.73)		
Language Mechanics	.18	(.70)	-.11	(.78)		
N	173		274			

CLASS-LEVEL ANALYSES (d.f.=1,20)

POSTTESTS	F	p	Effect Size
Reading Comprehension	12.86	.002	+.349
Reading Vocabulary	1.09	ns	+.121
Language Expression	4.76	.042	+.292
Language Mechanics	7.57	.012	+.302

ADJUSTED POSTTESTS IN GRADE EQUIVALENTS

	CIRC	CONTROL	Difference
Reading Comprehension	5.92	5.26	+.66
Reading Vocabulary	5.43	5.23	+.20
Language Expression	5.42	4.78	+.64
Language Mechanics	6.09	5.43	+.66

Table 6

Standardized Achievement Measures,
Special and Remedial Reading Students
Study 2

	Special Students				Remedial Reading Students			
	CIRC		Control		CIRC		Control	
	$\bar{x}$	(SD)	$\bar{x}$	(SD)	$\bar{x}$	(SD)	$\bar{x}$	(SD)
PRETESTS								
Total Reading	-.73	(1.64)	-.64	(.98)	-1.03	(.77)	-.81	(.77)
Total Language	-.56	(1.16)	-.56	(.93)	- .91	(.89)	-.81	(.84)
POSTTESTS								
Rdg. Comprehension	-.03	(1.14)	-.69	(.77)	- .71	(.82)	-.81	(.73)
Rdg. Vocabulary	-.11	(.92)	-.86	(.79)	- .69	(.86)	-.77	(.81)
Lang. Expression	-.71	(1.25)	-.56	(1.01)	- .78	(.95)	-.92	(.78)
Lang. Mechanics	-.52	(1.07)	-.63	(1.35)	- .69	(1.06)	-.85	(.88)
ADJUSTED POSTTESTS								
Rdg. Comprehension	.51	(.68)	-.25	(.86)	.00	(.67)	-.29	(.64)
Rdg. Vocabulary	.37	(.63)	-.34	(.72)	.02	(.73)	-.19	(.72)
Lang. Expression	-.24	(.71)	-.14	(.76)	.10	(.74)	-.36	(.65)
Lang. Mechanics	-.09	(.86)	-.23	(1.01)	.03	(.84)	-.32	(.79)
N	6		14		30		55	

INDIVIDUAL-LEVEL ANCOVA's

	F	p	Effect Size	F	p	Effect Size
POSTTESTS						
Rdg. Comprehension	3.66	.074	+1.02	3.50	.065	+.38
Rdg. Vocabulary	4.72	.046	+ .87	1.09	ns	+.25
Lang. Expression	<1	ns	- .11	2.97	.088	+.30
Lang. Mechanics	<1	ns	+ .11	3.20	.077	+.37

ADJUSTED POSTTESTS IN GRADE EQUIVALENTS

	CIRC	CONTROL	DIFFERENCE	CIRC	CONTROL	DIFFERENCE
Rdg. Comprehension	6.29	4.37	+1.92	4.83	4.11	+.72
Rdg. Vocabulary	5.59	4.15	+1.44	4.75	4.33	+.42
Lang. Expression	4.02	4.26	- .24	4.20	3.54	+.66
Lang. Mechanics	4.95	4.71	+ .24	4.81	4.01	+.80

Table 7
Writing Sample Measures, Full Sample
Study 2

	CIRC		CONTROL		ANOVA's (d.f.=1,170)	
	$\bar{x}$	(SD)	$\bar{x}$	(SD)	F	p
PRETESTS						
Total Reading	-.01	(1.08)	.00	(.94)	<1	ns
Total Language	-.09	(1.08)	.06	(.94)	<1	ns
Organization	1.63	(.57)	1.49	(.52)	2.98	ns
Ideas	1.85	(.61)	1.80	(.61)	<1	ns
Mechanics	2.12	(.57)	2.10	(.54)	<1	ns
POSTTESTS						
Organization	2.07	(.56)	1.96	(.49)		
Ideas	1.88	(.40)	1.75	(.44)		
Mechanics	2.32	(.49)	2.27	(.40)		
ADJUSTED POSTTESTS						
Organization	1.79	(.47)	1.68	(.48)		
Ideas	1.68	(.38)	1.54	(.41)		
Mechanics	1.88	(.38)	1.82	(.37)		
N	69		103			

CLASS-LEVEL ANALYSES (d.f.=1,20)

	F	p	Effect Size
POSTTESTS			
Organization	1.14	ns	+.212
Ideas	4.28	.052	+.308
Mechanics	< 1	ns	+.155

Table 8

Writing Sample Measures,
Special and Remedial Reading Students
Study 2

	Special Students				Remedial Reading Students			
	CIRC		Control		CIRC		Control	
	$\bar{x}$	(SD)	$\bar{x}$	(SD)	$\bar{x}$	(SD)	$\bar{x}$	(SD)
PRETESTS								
Reading Total	- .56	(1.51)	- .87	(1.02)	-1.13	(.83)	-1.02	(.61)
Language Total	- .44	(1.07)	- .73	(.74)	-1.08	(.89)	- .91	(.74)
Ideas	1.75	(.76)	1.62	(.68)	1.53	(.53)	1.67	(.54)
Organization	1.67	(.61)	1.29	(.40)	1.36	(.48)	1.39	(.43)
Mechanics	1.69	(.71)	1.83	(.46)	1.71	(.50)	1.97	(.47)
POSTTESTS								
Ideas	1.83	(.47)	1.52	(.45)	1.65	(.38)	1.61	(.46)
Organization	2.00	(.45)	1.67	(.62)	1.72	(.49)	1.67	(.53)
Mechanics	1.69	(.67)	1.82	(.49)	1.82	(.61)	1.98	(.46)
ADJUSTED POSTTESTS								
Ideas	1.70	(.31)	1.44	(.39)	1.62	(.34)	1.54	(.43)
Organization	1.79	(.23)	1.57	(.54)	1.67	(.40)	1.59	(.52)
Mechanics	1.75	(.52)	2.10	(.59)	2.42	(.66)	2.38	(.78)
N	6		12		18		23	

INDIVIDUAL-LEVEL ANCOVA's

	F	p	F	p
POSTTESTS				
Ideas	1.82	ns	<1	ns
Organization	<1	ns	<1	ns
Mechanics	<1	ns	<1	ns

Table 9

Individual Reading Inventories, Full Sample
Study 2

	CIRC		CONTROL	
	$\bar{x}$	(SD)	$\bar{x}$	(SD)
PRETESTS				
Total Reading	.01	(.99)	-.02	(1.01)
Total Language	.04	(1.03)	-.03	(.96)
POSTTESTS				
Word Recognition	.29	(1.09)	-.27	(.88)
Word Analysis	.21	(1.12)	-.20	(.87)
Grade Placement	.27	(1.05)	-.25	(.95)
Time*	-.35	(.96)	.29	(1.03)
Errors*	-.22	(1.01)	.21	(.98)
N	45		45	

INDIVIDUAL-LEVEL ANCOVA's

	F	p	Effect Size
POSTTESTS			
Word Recognition	12.73	.003	+.636
Word Analysis	10.54	.006	+.471
Grade Placement	5.59	.033	+.547
Time	7.05	.019	+.621
Error	7.26	.017	+.439

* Lower z-scores indicate that the students took less time or made fewer errors when reading.

Table 10

Informal Reading Inventory Measures,
Lowest-Achieving Third of Each Class
Study 2

	CIRC		CONTROL	
	$\bar{x}$	(SD)	$\bar{x}$	(SD)
PRETEST				
Total Reading	- .97	(.54)	-.92	(.66)
Total Language	-1.03	(.51)	-.96	(.44)
POSTTEST				
Word Recognition	-.05	(.98)	-.72	(.82)
Word Analysis	-.16	(.95)	-.64	(1.00)
Grade Placement	-.13	(1.08)	-.67	(.74)
Time*	.08	(1.13)	1.08	(.80)
Errors*	.42	(1.30)	.71	(1.14)
N	14		17	

INDIVIDUAL-LEVEL ANCOVA's

POSTTESTS	F	p	Effect Size
Word Recognition	11.33	.002	+.825
Word Analysis	3.04	.093	+.482
Grade Placement	4.13	.052	+.720
Time	13.41	.001	+1.249
Error	<1	ns	+.253

* Lower z-scores indicate that the students took less time or made fewer errors when reading.